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ABSTRACT

User-originated 16mm filmstrips for use with an IBM 1512 computer-controlled rear screen projector can be made at half the commercial cost. This report describes the procedures necessary for preparing, photographing, and processing either a black-and-white or color filmstrip for a computer-assisted instruction program. Master preparation, typography, artwork, and photographic techniques are reviewed in a step-by-step manner. (MC)

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THE DEVELOPMENT OF VISUAL MATERIALS FOR CAI

TECHNICAL MEMO NO. 5

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THE DEVELOPMENT OF VISUAL MATERIALS FOR CAI

The intent of this paper is to discuss the purpose and results of various procedures and materials used in experiments to minimize expense and time in the preparation and production of computer-controlled films. The particular films under discussion are 16mm to be used on a computer-controlled rear screen projector (IBM 1512).* Such a filmstrip may be in color or in black and white, and it may consist of up to 1,022 different frames which are individually accessible in any order and frequency that an author may desire. The address, located in the standard sound track area is used to call up a frame as desired in a course. The major portion of this paper describes some differences and relative advantages found as a result of research currently conducted. No perfect or final design has been developed for filmstrip production. Any new or promising technique will be investigated.

The photography for computer-controlled films is done with a 16mm camera capable of single frame exposure. Tables 1 and 2 summarize production processes used for coded filmstrips at The University of Texas CAI Laboratory in 1968 and 1970, respectively. Experimental research has brought the costs of film production down to a reasonable level. A filmstrip of 100 frames formerly could cost in excess of $1,000 (or $200 for 20 frames) for the first print. However, precise cost comparison is difficult, due to incomplete labor and materials quotations. A 20-frame filmstrip may now be produced for approximately $97 or less (see Table 3). Turn-around time has been improved greatly, due to faster methods of basic preparation. A "simple" (text typed, one-color gel) filmstrip can now be prepared, photographed, and processed in two to three weeks (see Table 2). In the past, it would have taken two to three months to produce the same filmstrip. The time difference is due to improvements of time-consuming media and photographic processes in which uncertainty of results at many stages, in the past, made extensive reprocessing necessary. The major step that has shortened the time required is the use of typewritten masters. This procedure has eliminated (in most instances) the need for Veritype printing, applied letters or hand lettering. The Veritype printing was done is strips that had to be cut and pasted on poster board (see Table 1). This was a slow and expensive operation. The use of pressure-sensitive letters or symbols is also tedious, time-consuming,

*For technical details of the projector and filmstrips, see IBM 1512 Image Projector Film Preparation Guide, IBM Corp., San Jose, Calif.

and costly, but it does combine well with the typed texts. This form of art work is used when special symbols or letters are not available in the standard typewriter font. The reduction in the cost of filmstrip production has simultaneously lowered the cost of revision.

Filmstrips are made for a specific purpose and are used in a programmed educational course of study. The author of the course decides how much of his program will be displayed on the 1518 or 2740 typewriter printout or 1510 cathode ray tube and what portion will be best displayed on the rear screen projector (1512) by use of a filmstrip. Some of the factors in this decision are:

(1.) A single frame in the filmstrip can be called up many times in the program.

(2.) The projector displays information more quickly than the typewriter does.

(3.) Color can be used in a filmstrip for interest, emphasis, or continuity of concept development.

(4.) Certain symbols, letters, or photographs are not available in standard type fonts or computer-language characters.

(5.) A display may be held on the projection screen while interactions on the cathode ray tube or typewriter are taking place over a fairly long span of time.

(6.) What the cost of the filmstrip is in relation to cost of coding the text in a program.

(7.) What educational merit the filmstrip has.

(8.) Will placing the text and tables on film minimize computer disk and core memory storage requirements?

The media person meets with the author at this point and discusses various procedures that can be used in the production of the filmstrip. Decisions are made, and then a representative text-frame master is submitted to the author. If the author approves the draft, work is begun on the masters for the entire filmstrip (see Figure 1). These masters, at completion, are again submitted to the author for final approval before the 8"x10" black-and-white negatives are made. This is a very vital step in the production of a satisfactory, professional filmstrip. The masters can be changed, corrected, or deleted; the filmstrip cannot be altered (see Figure 2).

Text masters are usually prepared on frosted acetate. Masters that are totally comprised of art work are usually done on 8"x10" poster board, and the 8"x10" negatives are photographed without enlargement;

35mm color slides are sometimes photographed directly onto the 16mm filmstrip. The frosted acetate is used for typed masters, line drawings, and applied pressure-sensitive letters. This typing is done in an area of 4-1/2"x6-1/2". This enlarges proportionately to the 8"x10" black-and-white negative, with a half-inch to three-quarter inch border. This results in the reduction of all typing, printing, or drawing in proportion to the final 16mm film frames of 1/4"x3/8".

Typing on frosted acetate (4 1/2"x6 1/2") enlarges to (8"x10") without any breakdown in letters. A filmstrip to test different forms of printed texts was made in April 1969. This test showed that the typed masters compared very favorably with the masters hand-done with pressure-sensitive letters and those done on a "photo-composer." The cost and speed in production were also factors in this choice. Educational procedures are, and should be, subject to constant change and revision. Typing the texts for the filmstrips has provided an inexpensive and acceptable method to develop and revise filmstrips.

Handwork on the masters is done with various technical pens using black India ink. Dry transfer letters and symbols are often used on a master which also has typed text and line drawings. No master should have more than nine lines if legibility for fast reading is expected. Letter sizes of 24-point should be used if dry transfer letters are utilized. Smaller sizes are not easily read and allow too many lines on a single frame. The frames should be kept as uncluttered and simple as possible. Too much information on a single frame can defeat the author's purpose.

The 8"x10" black-and-white negative of the text master has clear letters or symbols on a black background. The clear portions of the negative may be colored if the author considers it desirable. Photographer's color gel is cut and taped to the back of the negative. Color test filmstrips were made in 1968, 1969, and 1970. Color materials checked included Zipatone, 3M adhesive color, Bourges, Diazo color film, Par Lab, and photographer's color gel. The color gel produced more true color fidelity and provided a large selection of colors. The gels are inexpensive and easily obtained. Diazo color film photographed well, but it is expensive, and each sheet has to be color developed with ammonia.

Kodachrome II and Ektachrome Commercial 7252 (ECO) films were also tested. The 7252 (ECO) reduced the print contrast problem associated with Kodachrome II. This film can be purchased precoded from W. A. Palmer Films, Inc., San Francisco, California. The IBM code address master can be used with 7252 (ECO) film that is not precoded and is less expensive. The picture master and address master must be synchronized by some method so that the two films are in proper frame-to-frame position for printing (see Figure 3). An answer print is made on 7387 film. This film is preferred because of greater edge sharpness and higher resolving power. Any number of prints can be made, and all will be of equal quality. The answer print should be inspected for correctness, and prints can then be ordered if the print is satisfactory.

The 8"x10" color-backed negatives are back-lighted and photographed on 16mm 7252 (ECO) film in sequence. A light-box is used for this. This light-box is inexpensive and easily built (see Figure 4). The same box is used for alignment of the negative on an acetate cel. A registration pen bar is taped to the top of the box, and an Acme field chart is used to align the negative on the cel. This assures squared and centered frames in the filmstrip. This pre-alignment is necessary to reduce errors and to save photography time.

TABLE 1

Filmstrip production procedures in 1968:

1. Rough draft from author
2. Veritype printing of text
3. Composition of frames, by media department, by cutting and pasting printed strips
4. Author approval and proofing
5. 10"x12" black-and-white negative made from text or master
6. Application of color gel to negative
7. Alignment and mounting of colored negative to acetate cel
8. Photography of masters with 16mm stop-frame camera
9. Processing of filmstrip
10. Editing of filmstrip
11. Processing of master print combined with code address master
12. X number of prints made
13. Mounting on reels for projection

TABLE 2

Filmstrip production procedures in 1970:

1. Author's rough draft
2. Master layout from media department
3. Typewritten text in ten field format on frosted acetate, or 8"x10" original masters or 35mm color slides
4. Author proofing and approval
5. 8"x10" black-and-white negative made of master (if color gel is to be used)
6. Color gel applied to back of negative
7. Alignment of negative on Acme punched acetate cel
8. Photography with single frame 16mm camera and Ektachrome Commercial 7252 film
9. Processing of 16mm film
10. Number of needed prints made
11. Mounting on reel for projection

TABLE 3

Costs of producing a 10-frame filmstrip from colored 8"x10" negatives, March, 1970:

1.	Secretarial time: 4 hours @ $2.50/hour	$10.00
2.	Alignment, coloring, proofing and hand work by media person: 8 hours @ $3.00/hour	24.00
3.	Negatives (8"x10")	20.00
4.	Pre-coded film (f0 ft.)	15.21
5.	Developing film and 1 answer print	12.00
6.	X initial prints (usually 2-3)	6.00 ea.
7.	Camera time	10.00
TOTAL		$97.21

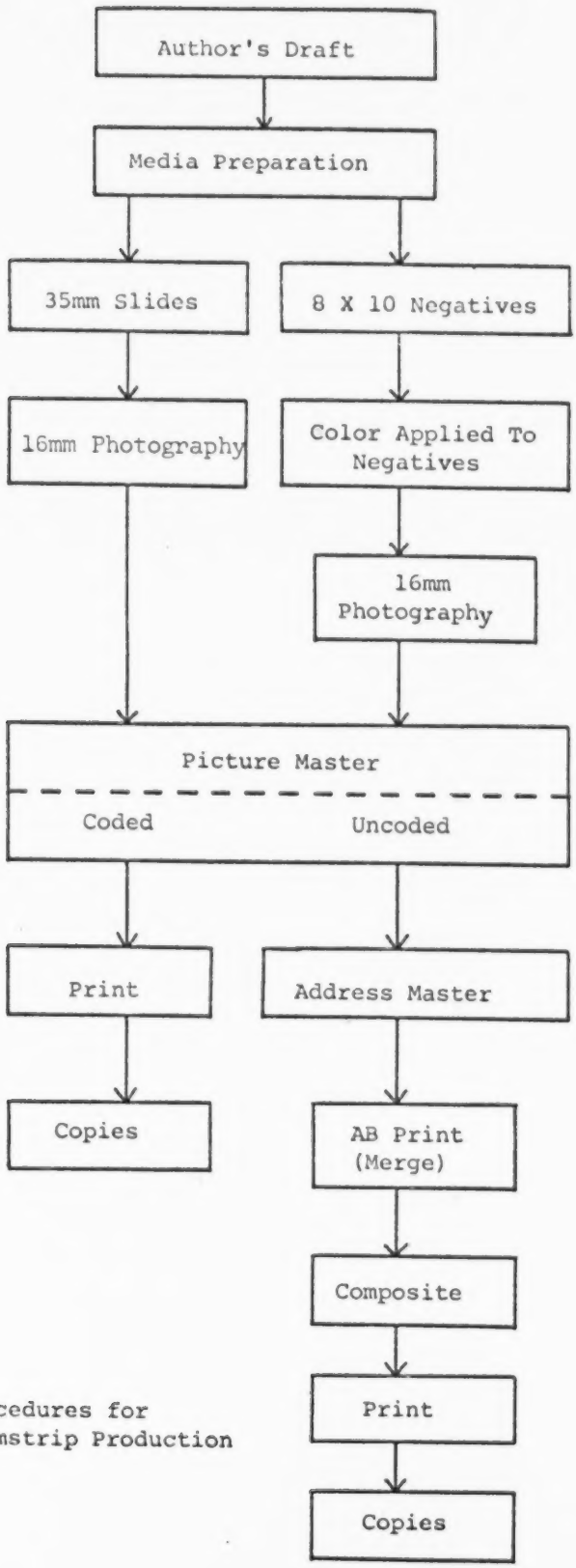


Figure 1.--Procedures for Filmstrip Production

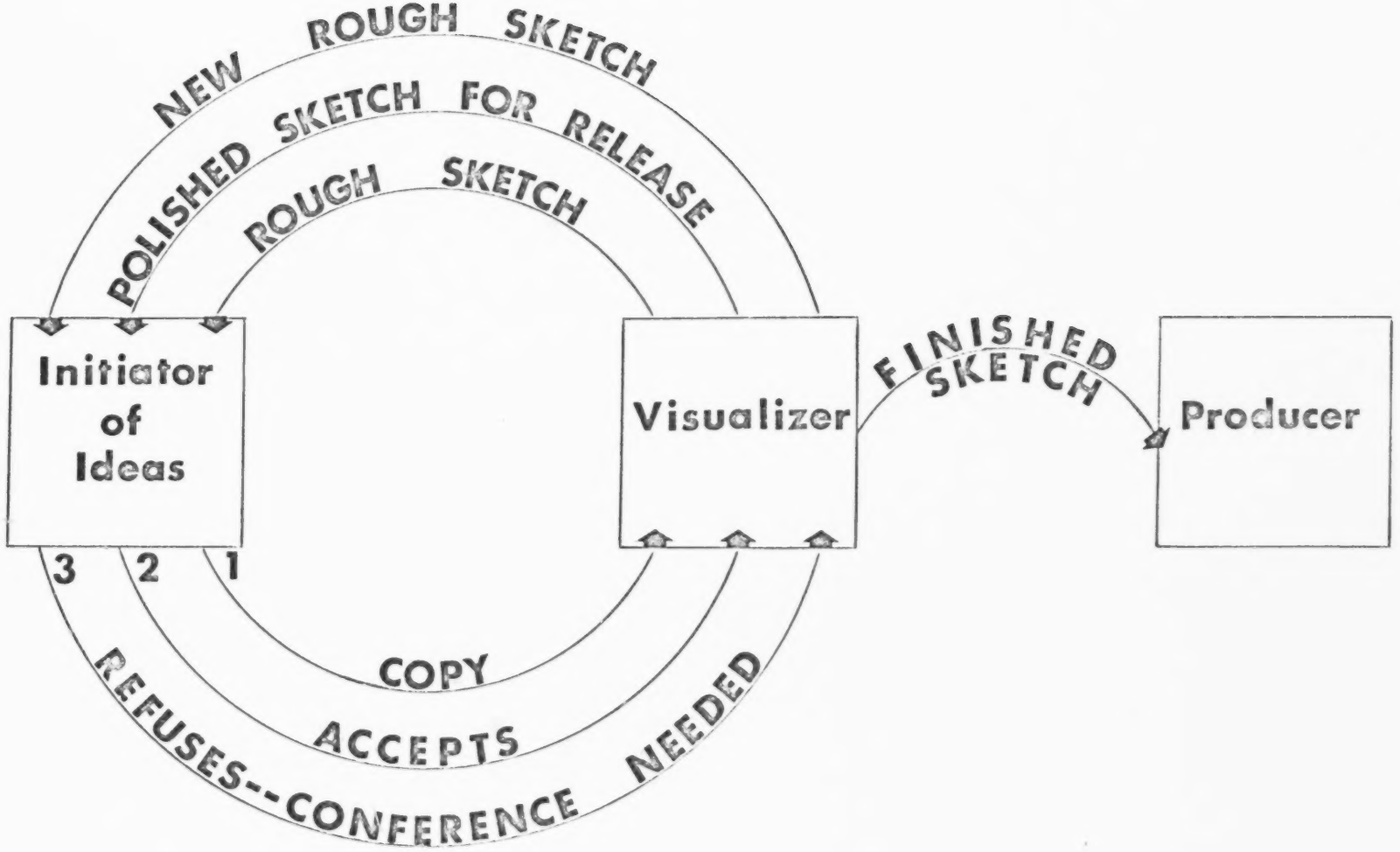

NEW ROUGH SKETCH
POLISHED SKETCH FOR RELEASE
ROUGH SKETCH
Initiator of Ideas
Visualizer
FINISHED SKETCH
Producer
3
2
1
COPY
ACCEPTS
REFUSES--CONFERENCE NEEDED

Figure 2

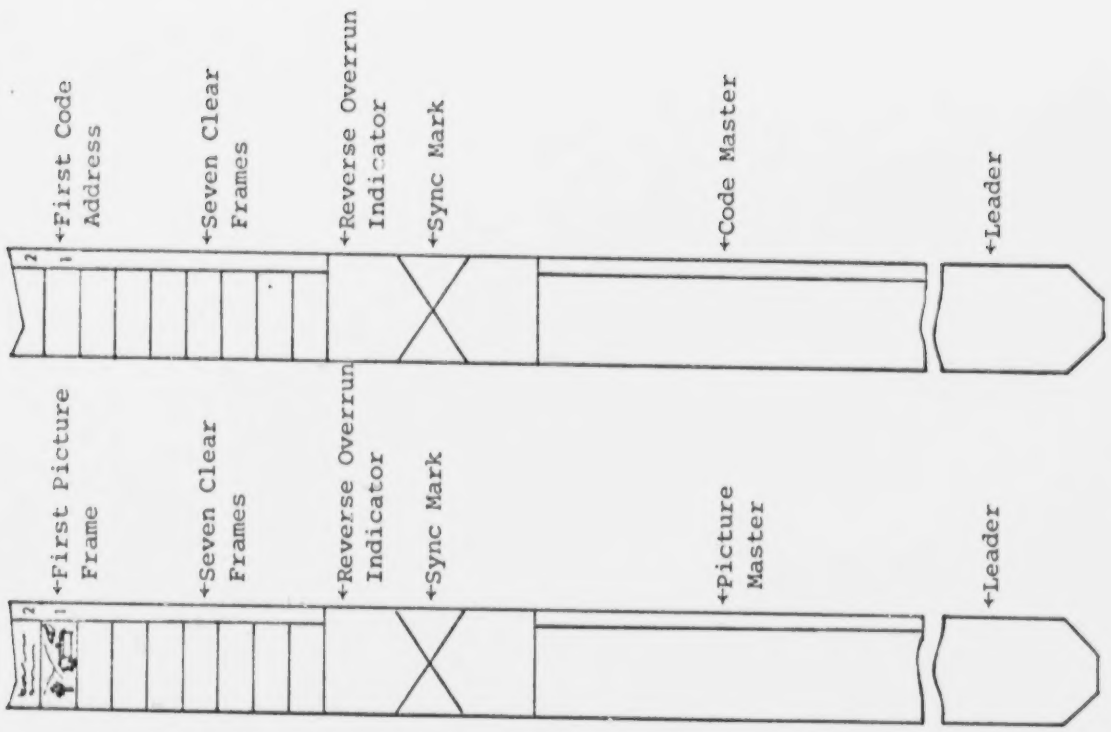


Figure 3.--Synchronization of Code Master and Picture Master

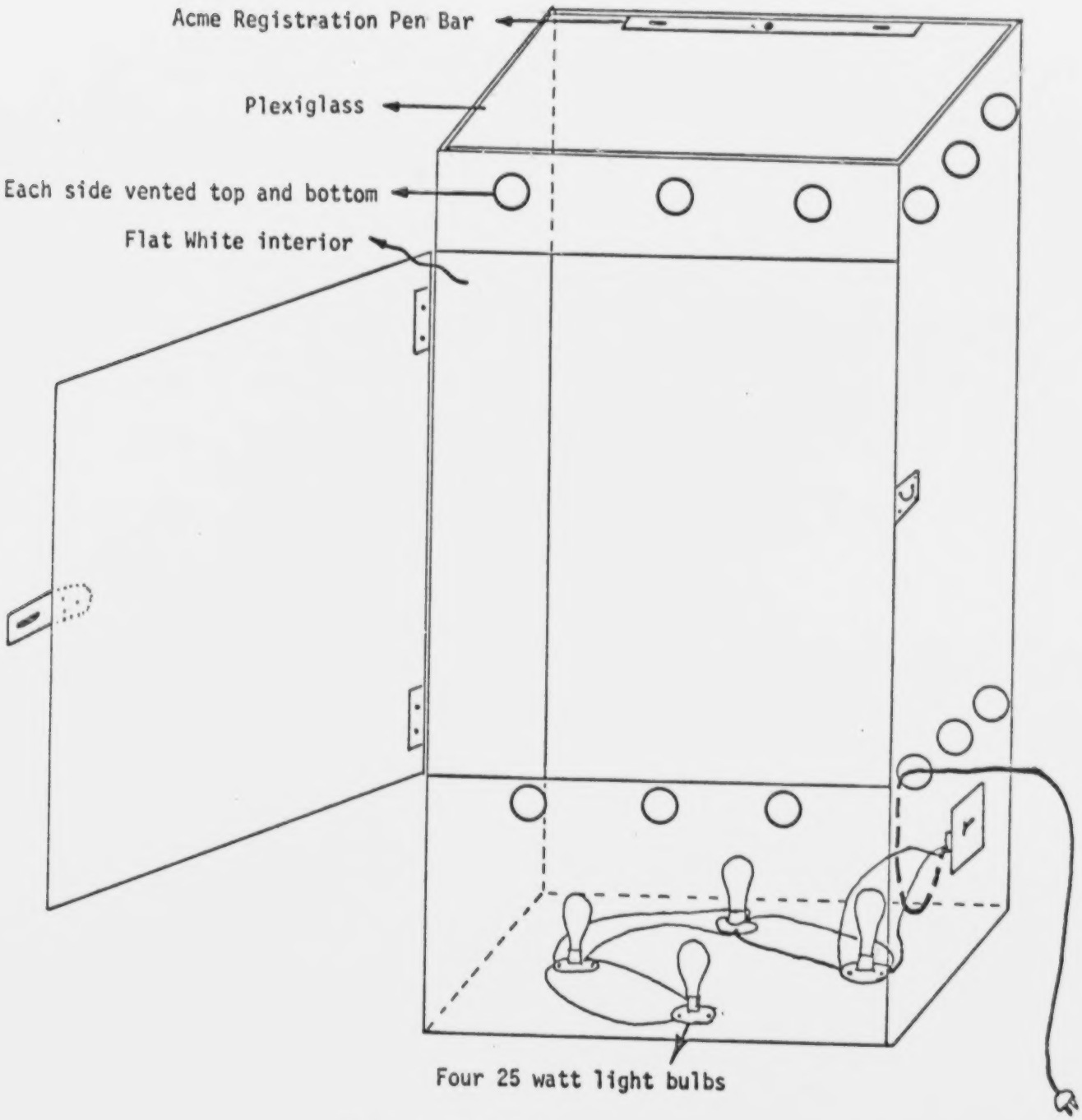
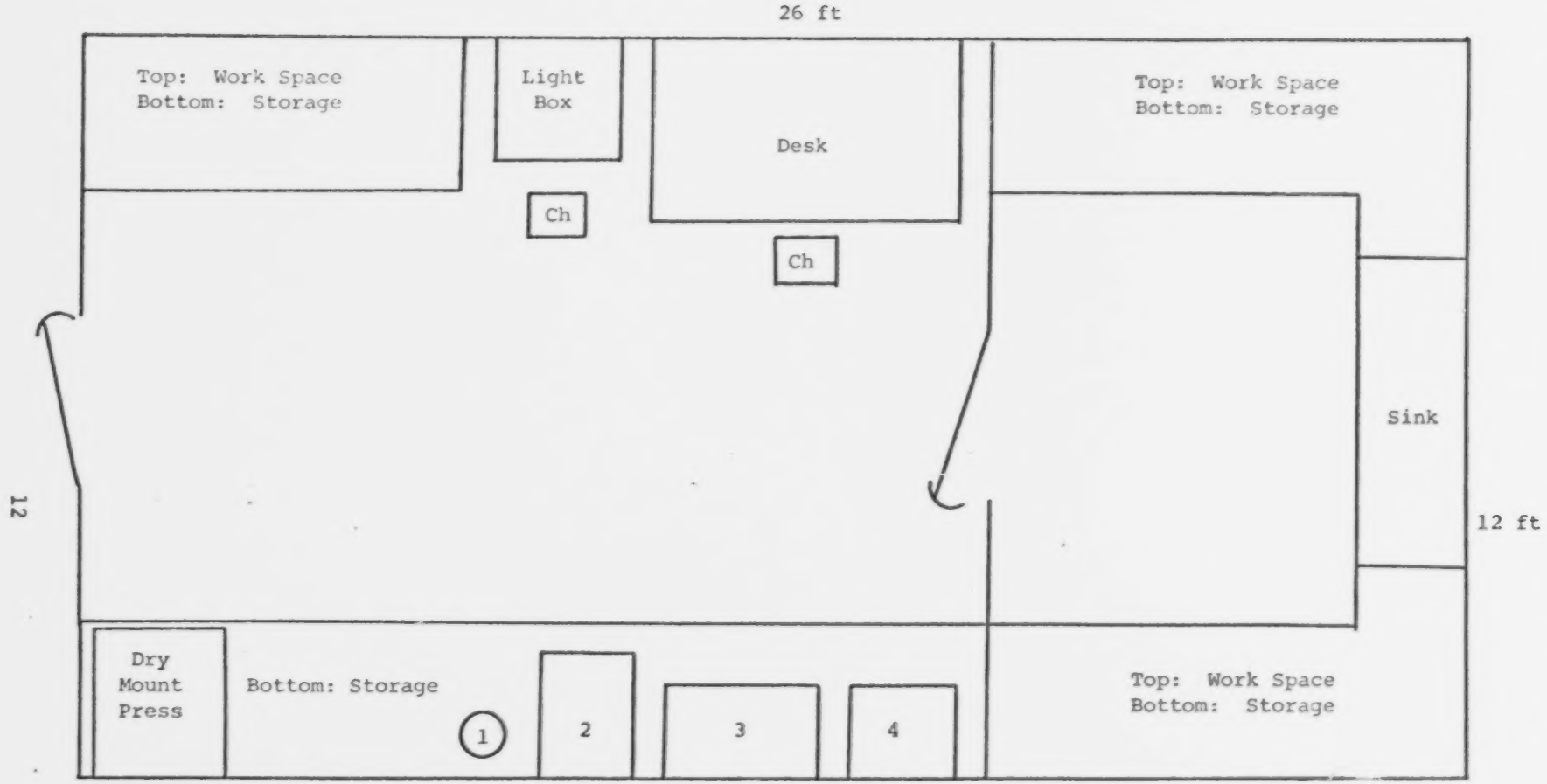


Figure 4.--Light Box



1. Diazo Developer
2. Dry Photo Copier
3. Visual Aid Printer
4. Thermofax

Media and Resource Room